

ORIGINAL

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NOKIA

1101 Connecticut Ave. N.W., Suite 910, Washington, D.C. 20036

June 19, 2000

Ms. Magalie Roman Salas
Office of the Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
12th Street Lobby, TW-A325
Washington, DC 20554

RECEIVED
JUN 19 2000
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Re: ***Ex Parte* Presentation**
CC Docket No. 94-102

Dear Ms. Salas:

On June 13, 2000, Mike Wrape and Leo Fitzsimon of Nokia met with Kris Monteith, Blaise Scinto, Patrick Forster and Martin Liebman of the FCC Wireless Telecommunications Bureau. The purpose of the meeting was to discuss Nokia's views regarding the implementation of handset-based solutions for E911. The attached materials were presented at the meeting.

Pursuant to Section 1.1206 of the Commission's Rules, an original and one copy of this letter are being filed with your office. If you should have any questions or need further information, please do not hesitate to contact me at (202) 887-5330.

Sincerely,



Leo R. Fitzsimon
Director, Regulatory and Industry Affairs
Nokia Inc.

Cc: Kris Monteith, FCC Wireless Telecommunications Bureau
Blaise Scinto, FCC Wireless Telecommunications Bureau
Patrick Forster, FCC Wireless Telecommunications Bureau
Martin Liebman, FCC Wireless Telecommunications Bureau

No. of Copies rec'd 0
List A B C D E

A faint, grayscale background image of a Nokia mobile phone, likely a Nokia 3110, is visible. The phone is shown from a front-three-quarter view, with its screen and keypad clearly discernible. The text is overlaid on the upper portion of the phone's body.

E-911 Phase II Implementation Issues

Nokia Inc.

June 13, 2000

Customer Carriers Drive Our Development

- US Carriers are Nokia Mobile Phones' end customers
- Customers drive our product development plans and roadmaps
- Nokia manufactures handsets for all US wireless protocols:
 - AMPS
 - TDMA
 - GSM-1900
 - CDMA
- We have a large number of customers to please, all with different views/plans regarding FCC's E-911 mandate
- To this date, our view of carrier/customer E-911 deployment plans is very unsettled
- Currently appears that Nokia must implement all possible E-911 solutions simultaneously to support the mandate!

Phase II Major Carrier Deployment Understanding

- Nokia has actively polled our carrier/customers about their E911 plans
- Carriers remain very uncertain about their E911 plans
- No carrier has placed an order for GPS handset solutions
- To date, there has been little demand from them for GPS in handset
- Here is summary of our understanding by wireless protocol:
 - **CDMA:**
 - Heavy support for network based solutions
 - Triangulation involving handset (e.g. AFLT)
 - Little demand for GPS
 - **TDMA:**
 - Some GPS
 - Some network
 - **GSM1900:**
 - Triangulation involving handset (e.g. E-OTD)
 - Very little GPS

Status of Location Technologies

Network (TOA/TDOA)	Very Good?	Vendor Data Only	Meet Req't?(1)	Network Dependent	\$0
Ranging: E-OTD: AFLT:	Good Fair	Vendor Data None	Meet(2) Won't Meet	Network Dependent	Low Low
Standalone GPS:	Good(4)	Vendor Data	Exceed(3)	Poor	High
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(1) Believe network will meet req'ts in CDMA, but difficult in TDMA

(2) Expected to meet FCC accuracy requirements as technology matures

(3) Ensured by removal of Selective Availability

(4) However, integration of this technology with a mobile handset is a big challenge

Location Technology Status Caveats (1)

- In general, vendor advertised accuracy and system availability figures are VERY optimistic!
- Nokia believes that carriers do not have enough time to independently verify accuracy/availability performance of different technologies. Only way to do this is with full testing under all conditions.
 - All environments are different: multipath, radio interference sources, day vs. night makes a difference for GPS because of the ionosphere delay
 - All technologies (GPS, E-OTD, AFLT, network technologies) will yield completely different accuracy figures depending on where the technology is being tested.
 - It is believed that all technology vendors have so far presented results corresponding to the most favorable environment for their technology.
- With respect to Wireless Assisted GPS:
 - Difficult to perform meaningful and realistic testing when the standards compliant network elements and representative GPS enabled handset required for location are not available
 - Total system accuracy and availability of this technology depends not only on the handset, but on the assistance received from the network as well!

Location Technology Status Caveats (2)

- Examples of Vendor Testing Conditions (Nokia's Understanding):
- SnapTrack tests during STCTG not necessarily performed in realistic conditions:
 - Semi-integrated GPS receiver/mobile phone prototype,
 - memory configuration used is not realistic-> tested with 16 Mbit configuration, but advertise a smaller configuration to prospective customers,
 - E-911 test was conducted when the phone was idle, multiplexing of CDMA comm. and GPS.
- Neither TruePosition nor Cell Loc have released performance figures yet in harsh environments like dense urban areas (high likelihood of multipath effect)
- US Wireless has not published their performance in rural areas (tough area for the RF Fingerprinting technology because of the lack of multipath pattern, RF Fingerprinting is based on the presence of multipath).
- **CONCLUSION:** Carriers are required to announce their plans to the FCC in approx. 4-months based on incomplete technology evaluations

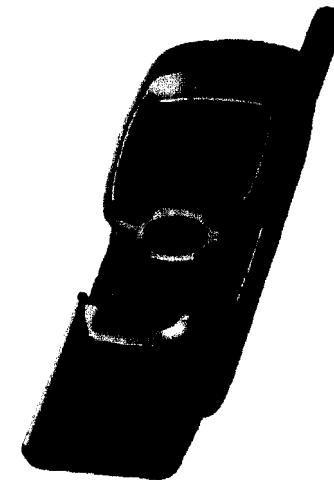
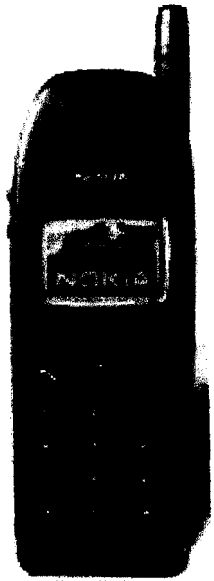
Location Standards Status

TDMA	TIA/EIA-136 Rev C In Progress	N/A	N/A	YES	YES
CDMA	IS-801 Approved	N/A	YES	YES	YES
AMPS(CDMA)	PN-4662 (IS-817) In Progress	N/A	N/A	YES	YES
AMPS(TDMA)	Not Started				
GSM-1900	ETSI, 3GPP LCS Rel 98,99 Approved	YES	N/A	YES	YES

Location Standards Status Caveats

- CDMA: IS-801 published but may have to be re-visited because of SA removal
- TDMA: just started. Only the SAMPS high-level goals and system architecture (Stage 1) and location procedures (Stage 2) have been defined so far. The core of the standard work (message definition) still needs to be defined.
- AMPS: Current AMPS standard only applicable to dual-mode CDMA/AMPS phones
- Standard for dual-mode TDMA/AMPS phones still needs to be defined and it can only be defined once the TDMA location standard is approved.
- Roaming issues not simple.
- CONCLUSION:
 - Current location standards are very immature, being developed, or non-existent
 - Nokia is involved in all standards bodies and in the end must implement solutions in the handset to satisfy all standards.

GPS Receiver/Mobile Phone Integration: Unique to Each Handset Design



- Size impact to PCB
- Antenna
- Power consumption impact to batter
- Additional cost to product

GPS & Mobile Handset Integration Challenges (1)

- To date, no handset manufacturer has introduced a digital cellular handset with an integrated GPS receiver. (Benefon has announced a GSM+GPS product, but it has not been seen on market yet. Denso has Naviewn GPS receiver which must be attached to PDC phone for NTT DoCoMo location network)
- One CDMA chipset supplier is advertising that they will have GPS integrated into their chipset late this year.
 - Claim that working GPS-enabled handsets will appear on the market a few months later
 - Claim that addition of GPS function to handset will cost less than \$10
- While Nokia believes that this company can deliver on their chipset promises, we urge the FCC to consider that this company is not a handset supplier and to instead consider the recommendations of the world's 3 largest handset suppliers regarding:
 - Technical challenges and Performance
 - GPS handset availability schedules
 - Total Cost of adding GPS to handset
 - Impacts to product size

GPS & Mobile Handset Integration Challenges (2)

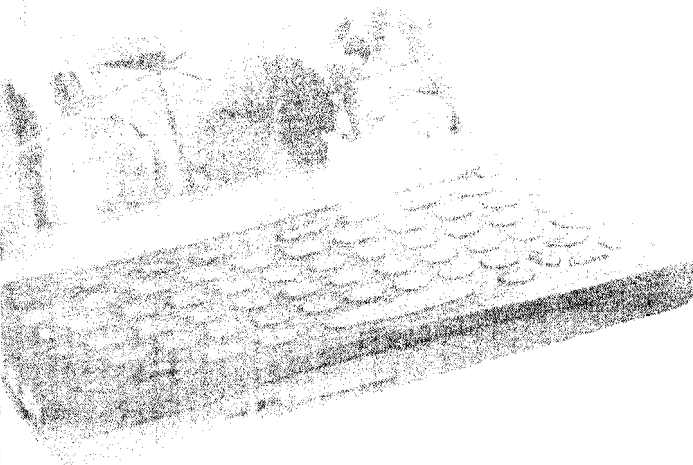
- **Technical Challenges:** Integration of a highly sophisticated, extremely sensitive GPS receiver with another highly sophisticated CDMA, TDMA, or GSM radio transceiver should not be trivialized!
- Some of the handset integration challenges include:
 - GPS-to-Cellular antenna isolation issues and GPS antenna location
 - RF interference (GPS on cellular/PCS, cellular/PCS on GPS)
 - Time multiplexing of GPS and cellular radio functions
 - Impact of additional memory to handset for:
 - GPS core software
 - Wireless Assist standards software (e.g. IS-801)
 - User interface software
 - Managing power consumption of new receiver feature
 - Note that some of these problems must be solved for each different handset model!
- **Performance:** It is generally accepted in the industry that standalone GPS will not be adequate to meet FCC mandate. GPS is only practical when assisted by the network.
 - Therefore, true wireless assisted GPS performance can only be assessed when all elements are in place: GPS enabled handset and standards compliant servers

GPS & Mobile Handset Integration Challenges (3)

- **Schedule:** Nokia does not agree with the statement that GPS capable handsets can be available on the market several months after first GPS enabled chipsets are available (see typical handset development timeline on next slide):
 - Chipset availability is by no means the “end-of-the-line” when bringing a product to market with a feature as complex as GPS added to it
 - Significant software development activities still remain (e.g. User I/F, WAG stds)
 - Significant integration issues just begin! (I.e. first time integration of GPS function into mobile handset - Antenna, RF, regulation, noise, software, ASIC bugs, etc!)
 - Significant testing efforts begin (e.g. Functional, performance, manufacturing test development, network testing, interoperability testing, E911 compliance testing)
 - Manufacturing challenges (e.g. any special tuning required, new components, testing)
 - After sales support (ramping up after sales to support new feature like GPS)
- **Additionally,** GPS enabled chipsets referred to are for CDMA market only. Nokia development activities must consider TDMA and GSM as well.

Typical Handset Development Timeline

- Printed Circuit Board "Engine" development time: ~6-12 months
(Required for addition of new major feature like GPS)
 - Product Specification Phase: ~2 months
 - Product Design Phase: ~8 months
 - Product Testing/Verification Phase: ~9 months
 - Product Maturity for volume ramp-up: ~2 months
- Typical Time to New Product Ramp-up: ~27-33 months



GPS & Mobile Handset Integration Challenges (4)

- **Handset Cost:** Nokia does not believe a total additional cost figure of less than \$10 for addition of GPS to a mobile handset.
 - Nokia believes that for a highly integrated GPS solution, the bill-of-materials cost alone will exceed \$10 (RF and BB cellular/PCS IC's integrated with GPS RF/BB).
 - For less integrated solutions, this cost will be higher.
 - IPR situation is also very unsettled at this time and will add cost to addition of the GPS feature.
 - Additional non-material costs will include:
 - Manufacturing
 - Testing
 - Warranty
 - Even in its most integrated form, GPS could easily end up costing the consumer around \$20 extra. In the late '01 timeframe, this could be 20-25% of the cost of the phone itself (for low end products).

GPS & Mobile Handset Integration Challenges (5)

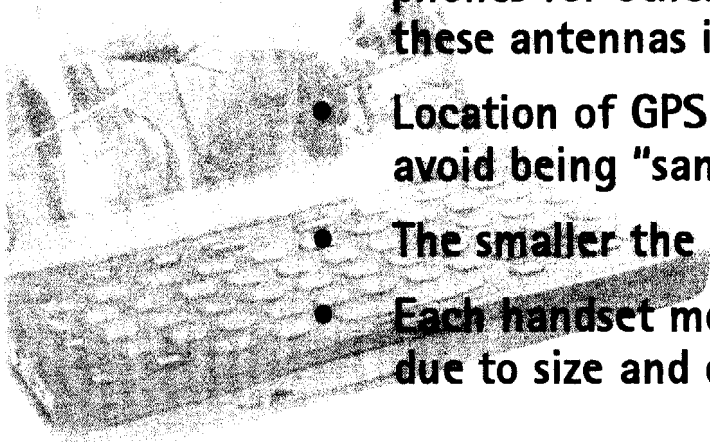
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- Even with highly integrated solution, there is a size impact.

- Additional pins on BB and RF Ics
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- Additional regulation for more circuitry
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- QC is claiming this is possible, but they are not an antenna supplier
- CDMA handsets typically use external/retractable antennas. Nokia builds phones for other protocols which use only internal antennas. GPS sharing of these antennas is highly unlikely.
- Location of GPS antenna is very critical. Must be located at top of phone to avoid being "sandwiched" between hand and head.
- The smaller the phone, the bigger the challenge.
- Each handset model potentially requires a different GPS antenna configuration due to size and overall mechanics makeup.



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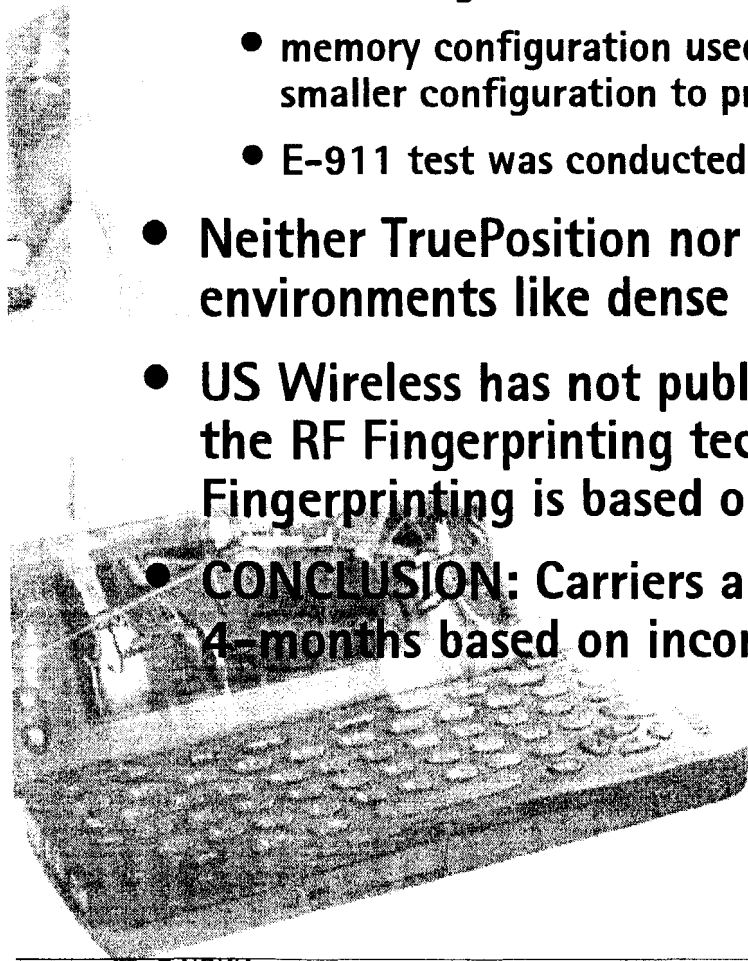
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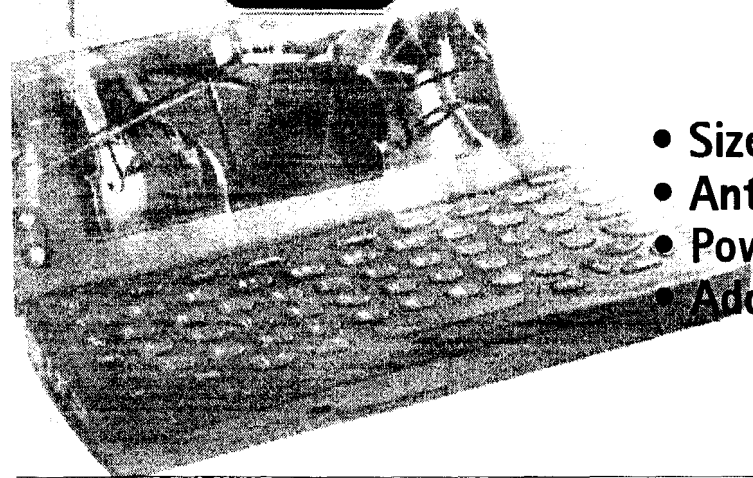
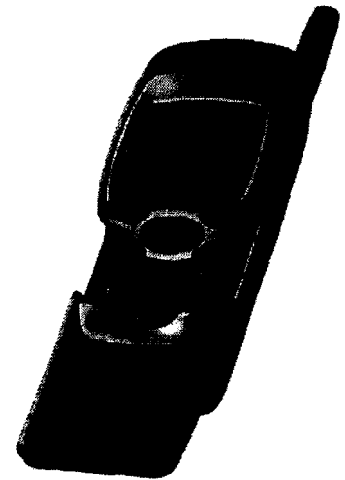
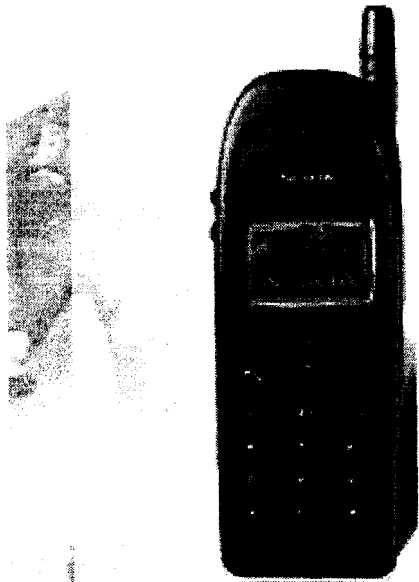
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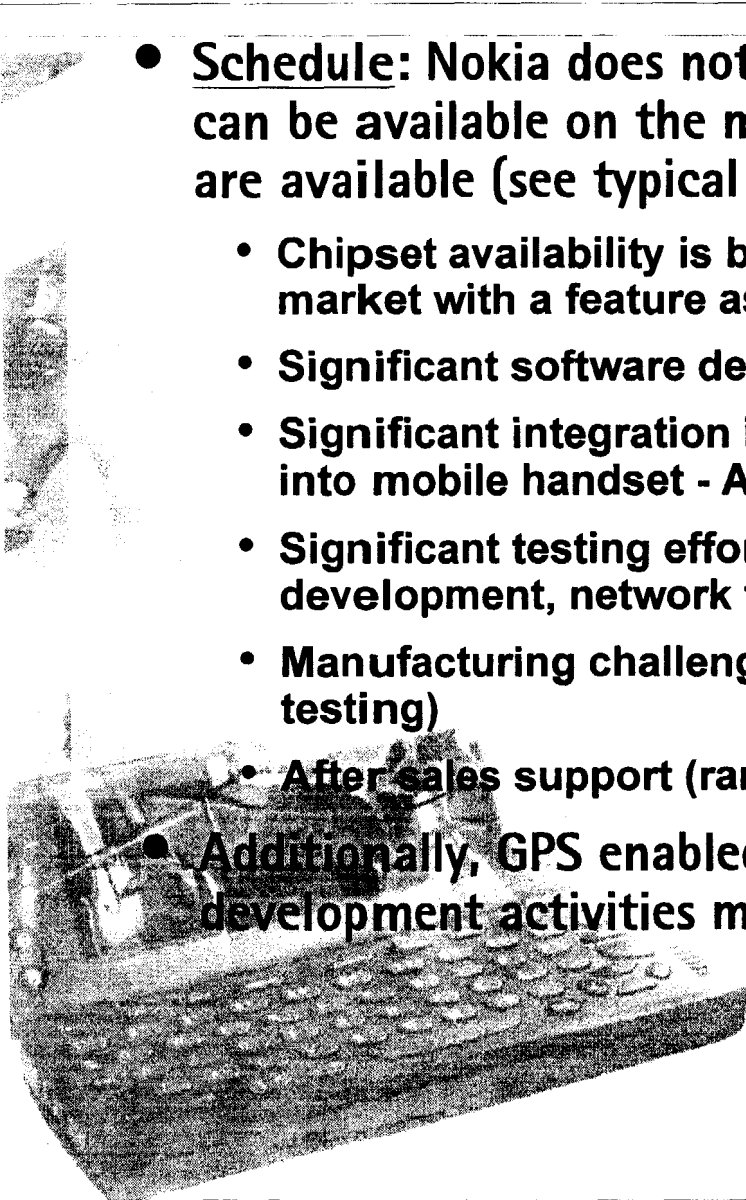
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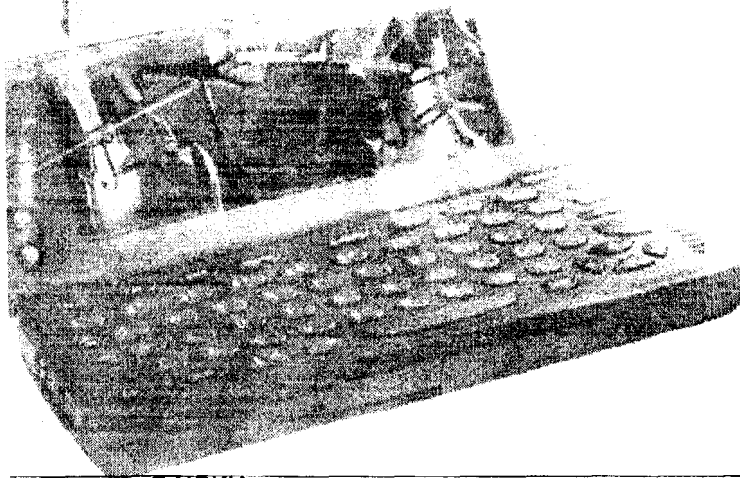
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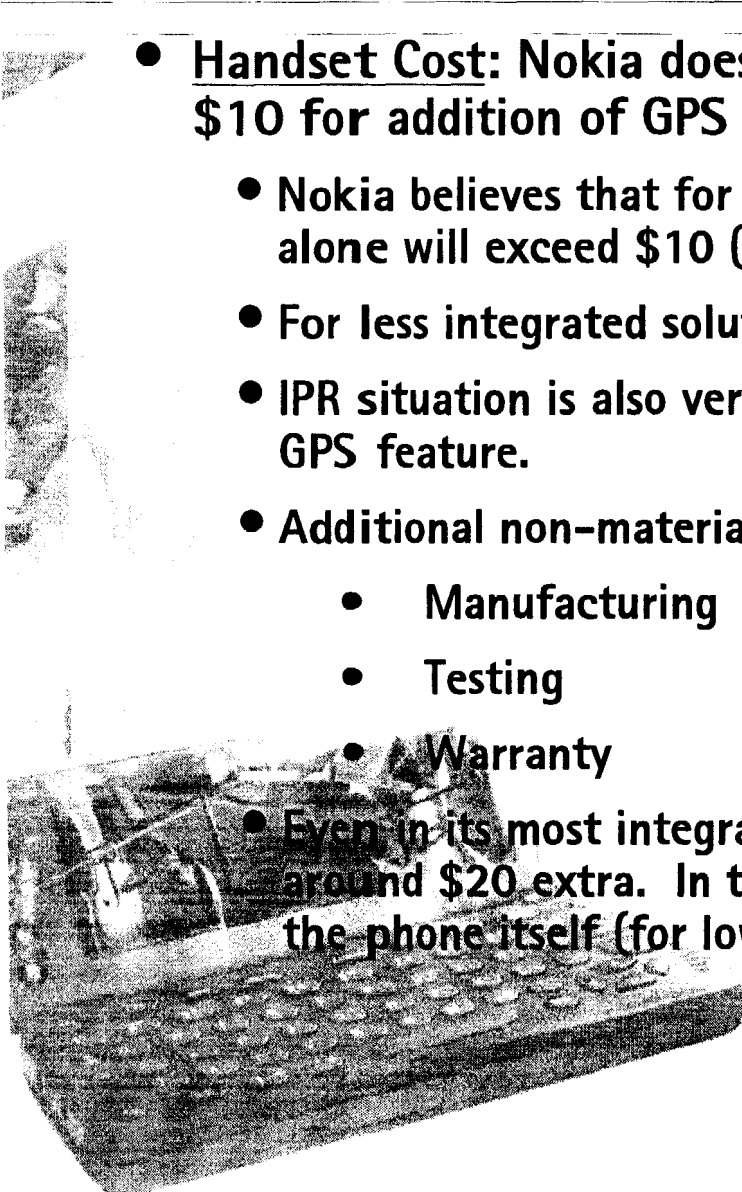
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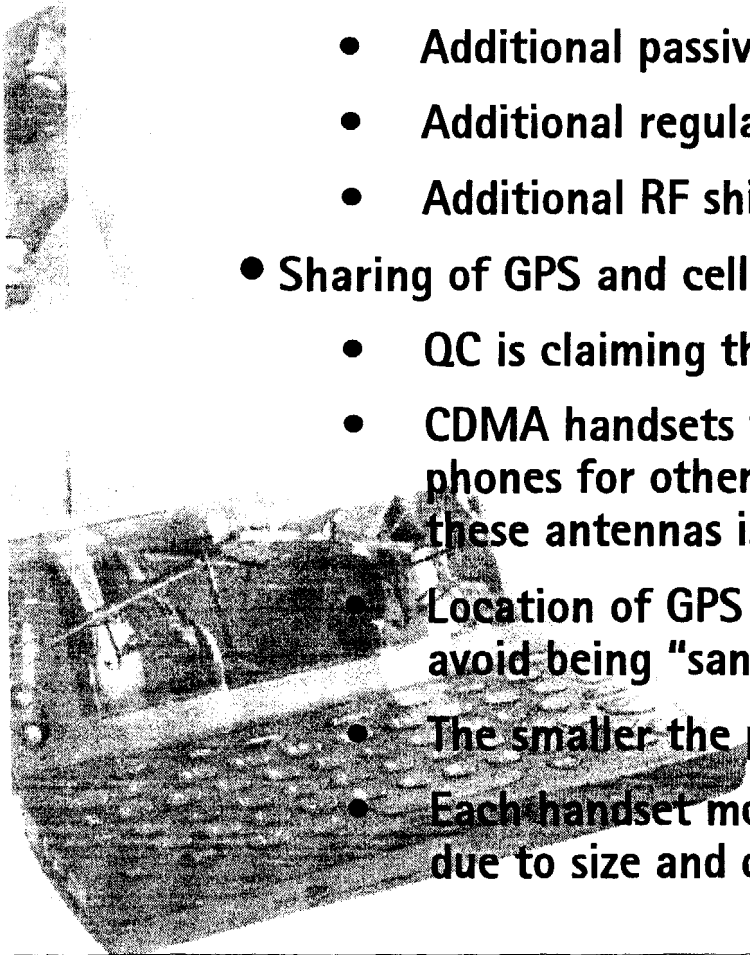
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Summary

- Our carrier/customers remain very unsure about the direction they should take. Appears that Nokia must implement all possible location technologies for E-911 simultaneously.
- Currently we have seen very small demand from customers for GPS enabled handsets. Our impression in talking to customers is that they would rather NOT have the higher priced handsets with GPS for E-911.
- Currently no carrier/customer has placed orders for GPS handsets
- Status of location technologies is very unsettled adding to carrier/customer confusion. Test data is largely from vendors and not conclusive.
- Emergence of location standards is just now happening. Standards tend to allow many/all location technologies (e.g. IS-801) and are either immature or still in development. Weakness of standards will delay network infra deployment since servers will have to support many features. This in turn will delay testing of technologies such as wireless assistance, AFLT, E-OTD, etc.
- Integration of an extremely high sensitivity GPS receiver into a wireless handset for a life-saving function like E-911 should not be trivialized. Nokia takes public safety very seriously and will deliver a high quality/high reliability to the market.